CLAIMS

1. A method of manufacturing an optical fiber by using an apparatus comprising an elongated microwave guide coupled to a resonant cavity substantially cylindrically symmetric about a cylindrical axis, the resonant cavity having a length L parallel to the cylindrical axis, an inner wall, and an outer cylindrical wall, the inner cylindrical wall comprising a slit having a width W and extending in a full circle around the cylindrical axis, and the guide having a longitudinal axis which is substantially perpendicular to the cylindrical axis and which does not intercept the slit, the elongated microwave guide configured to deliver microwave radiation energy having a vacuum wavelength λ to the resonant cavity, the width W of the slit and the length L of the resonant cavity both measured in a direction parallel to the cylindrical axis to satisfy the relationship: $W \leq \lambda/10$, the method comprising:

locating a substrate tube along the cylindrical axis and within the inner wall of the resonant cavity, the substrate tube having an inner surface and a length, the substrate tube and resonant cavity being substantially coaxial, and the resonant cavity being caused to move back and forth along the length of the substrate tube;

using Plasma Chemical Vapor Deposition to deposit layers of doped silica on the inside surface of the substrate tube;

thermally collapsing the substrate tube so as to form a preform rod;

causing an extremity of the preform rod to become molten; and

drawing an optical fiber from the preform rod.

2. The method of claim 1 wherein the substrate tube is vitreous.

3. The method of claim 2 wherein the substrate tube is cylindrical.

4. The method of claim 1 wherein locating the substrate tube, using Plasma Chemical Vapor Deposition, thermally collapsing the substrate tube, causing an

extremity of the preform rod to become molten, and drawing an optical fiber from the preform rod are performed in succession.

5. The method of claim 1 wherein the longitudinal axis does not bisect the resonant cavity.

6. The method of claim 1 wherein the length L of the resonant cavity is less than $\lambda/2$.

7. The method of claim 1 wherein the resonant cavity includes one or more open ends and further comprises situating a choke outside each open end of the cavity and adjacent thereto.

8. The method of claim 1 wherein the elongated microwave guide emerges into the resonant cavity, the elongated microwave guide being terminated by a body of material that is transparent to microwave radiation delivered by the elongated microwave guide.

9. A method of manufacturing an optical fiber preform rod by using an apparatus having an elongated microwave guide coupled to a resonant cavity substantially cylindrically symmetric about a cylindrical axis, the resonant cavity having a length L parallel to the cylindrical axis, an inner wall, and an outer cylindrical wall, the inner cylindrical wall comprising a slit having a width W and extending in a full circle around the cylindrical axis, and the guide having a longitudinal axis which is substantially perpendicular to the cylindrical axis and which does not intercept the slit, the elongated microwave guide configured to deliver microwave radiation energy having a vacuum wavelength λ to the resonant cavity, the width W of the slit and the length L of the resonant cavity both measured in a direction parallel to the cylindrical axis to satisfy the relationship: $W \leq \lambda/10$, the method comprising the successive steps of:

locating a cylindrical vitreous substrate tube along the cylindrical axis and within the inner wall of the resonant cavity, the cylindrical vitreous substrate tube having an inner surface and a length, the cylindrical vitreous substrate tube and resonant cavity being substantially coaxial, and the resonant cavity being caused to move back and forth along the length of the cylindrical vitreous substrate tube;

using Plasma Chemical Vapor Deposition to deposit layers of doped silica on the inside surface of a cylindrical vitreous substrate tube; and

thermally collapsing the cylindrical vitreous substrate tube so as to form the preform rod.

10. The method of claim 9 wherein the substrate tube is vitreous.

11. The method of claim 9 wherein the substrate tube is cylindrical.

12. The method of claim 9, wherein locating the substrate tube, using Plasma Chemical Vapor Deposition and thermally collapsing the substrate tube are performed in succession.

13. A method of manufacturing a jacket tube for an optical fiber preform by using an apparatus having an elongated microwave guide coupled to a resonant cavity substantially cylindrically symmetric about a cylindrical axis, the resonant cavity having a length L parallel to the cylindrical axis, an inner wall, and an outer cylindrical wall, the inner cylindrical wall comprising a slit having a width W and extending in a full circle around the cylindrical axis, and the guide having a longitudinal axis which is substantially perpendicular to the cylindrical axis and which does not intercept the slit, the elongated microwave guide configured to deliver microwave radiation energy having a vacuum wavelength λ to the resonant cavity, the width W of the slit and the length L of the resonant cavity both measured in a direction parallel to the cylindrical axis to satisfy the relationship: $W \leq \lambda/10$, the method comprising the successive steps of:

locating a cylindrical vitreous sleeve along the cylindrical axis and within the inner wall of the resonant cavity, the cylindrical vitreous sleeve having an inner surface and a length, the cylindrical vitreous sleeve and resonant cavity being substantially coaxial, and the resonant cavity being caused to move back and forth along the length of the cylindrical vitreous sleeve; and

using Plasma Chemical Vapor Deposition to deposit layers of undoped silica on the inside surface of the cylindrical vitreous sleeve.

14. The method of claim 13 wherein the longitudinal axis does not bisect the resonant cavity.

15. The method of claim 13 wherein the length L of the resonant cavity is less than $\lambda/2$.

16. The method of claim 13 wherein the resonant cavity includes one or more open ends and further comprises situating a choke outside each open end of the cavity and adjacent thereto.

17. The method of claim 13 wherein the elongated microwave guide emerges into the resonant cavity, the elongated microwave guide being terminated by a body of material that is transparent to microwave radiation delivered by the elongated microwave guide.

18. A method for performing Plasma Chemical Vapor Deposition, whereby one or more layers of silica can be deposited on an elongated vitreous substrate, the apparatus including an elongated microwave guide which emerges into a resonant cavity which is substantially cylindrically symmetric about a cylindrical axis, along which axis the substrate can be positioned, the cavity being substantially annular in form, with an inner cylindrical wall and an outer cylindrical wall, the inner cylindrical

wall comprising a slit that extends in a full circle around the cylindrical axis, and the guide having a longitudinal axis which is substantially perpendicular to the cylindrical axis and which does not intercept the slit, the slit having a width W the elongated microwave guide configured to deliver microwave radiation energy to the resonant cavity, the microwave radiation having a vacuum wavelength, λ, the width W of the slit being sized to satisfy the relationship: $W \leq \lambda/10$, the method comprising:

positioning a substrate tube in the cavity;

moving the cavity back and forth over the substrate tube;

using plasma chemical vapor deposition to deposit layers of doped silica on an inside surface of the substrate tube;

thermally collapsing the substrate tube to form a preform rod;

causing an extremity of the preform rod to become molten; and

drawing an optical fiber from the preform rod.

19. The method of claim 18 wherein the substrate tube is vitreous.

20. The method of claim 19 wherein the substrate tube is cylindrical.

21. The method of claim 18 wherein locating the substrate tube, using Plasma Chemical Vapor Deposition, thermally collapsing the substrate tube, causing an extremity of the preform rod to become molten, and drawing an optical fiber from the preform rod are performed in succession.

22. The method of claim 18 wherein the longitudinal axis does not bisect the resonant cavity.

23. The method of claim 18 wherein the length L of the resonant cavity is less than $\lambda/2$.

24. The method of claim 18 wherein the resonant cavity includes one or more open ends and further comprises situating a choke outside each open end of the cavity and adjacent thereto.

25. The method of claim 18 wherein the elongated microwave guide emerges into the resonant cavity, the elongated microwave guide being terminated by a body of material that is transparent to microwave radiation delivered by the elongated microwave guide.